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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/661,917
Filing Date: September 11, 2003
Appellant(s): FREESE ET AL.

Mitchell S. Bigel
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed May 7, 2008, appealing from the Office action mailed October 18, 2007.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

4,965,118	Kodera et al., hereinafter referred to as Kodera	10-1990

6,292,255	McCullough	09-2001
6,410,213	Raguin et al., hereinafter referred to as Raguin	06-2002
4,087,300	Adler	05-1978
5,342,737	Georger, Jr. et al., hereinafter referred to as Georger	08-1994

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claim 1, 3-10, 15-18, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 4,965,118 (Kodera et al., hereinafter referred to as Kodera) in view U. S. Patent No. 6,292,255 (McCullough) and U. S. Patent No. 6,410,213 (Raguin et al., hereinafter referred to as Raguin).

Kodera, in col 6, lines 5-68, in col 7, lines 1-24, and lines 42-45, in col 8, lines 15-68, in col 9, lines 60-65, discloses forming patterns of optical information recording medium (optical microstructures that are polygonal) by using a flexible

substrate (flexible disk), forming a hardenable resin (negative photoresist) that may include additives (photosensitizers, impurities) on the supporting layer (that is transparent to UV radiation, transmits UV light through), and forming the resin on the microstructures (microstructures buried in the liquid resin layer, resin mold), exposing to UV (rastering the UV radiation i.e., scanning the radiation beam) through the transparent flexible supporting layer (substrate), wherein the resin liquid layer thickness is non-uniform (liquid hardenable resin is applied on the uneven surface) and thicker than the pattern on the resin mold, and the pattern on the mold is independent of the variable thickness of the resin liquid applied, positioning the substrate on rollers such that resin liquid layer is on the cylindrical platform (roller), and the substrate (transparent supporting layer) is remote from the platform, and is impinged with UV radiation so as to perform an imaging process to form the corresponding pattern that is not distorted (no deformation) on the hardenable resin , and the substrate is conveyed by means of a conveyor (translating the substrate relative to the light), wherein the cylindrical platform (roller) is rotating while rastering axially the radiation (i.e., scanning the radiation) through the transparent supporting layer axially (see figures 5, and 6) (claims 1, 3-10, 16-17). Kodera, in col 8, lines 1-60, and in figures 4A, 4B, and 6, discloses that the microstructure includes a base portion and a top portion such that the top portion is narrower that the base, imaging the hardenable resin with UV to form a microstructure (imaged, cured) in the liquid resin such that the base portion is adjacent to the substrate (transparent supporting layer, see figure 5) (claim 4). Kodera, in col 7, lines 1-12, and in col 8, lines 34-37, discloses forming a hardenable resin liquid (negative photoresist

layer) on the uneven pattern of the information to be recorded, followed by hardening (exposure) and developing to form the resin mold (microstructure master) (claims 15). Kodera, in col 6, lines 7-67, in col 7, lines 1-24, in col 8, lines 32-53, and in figures 1-8, discloses that the resin mold (master microstructure) is used to form stampers (second generation stampers), and the stampers are used to form microstructures (third generation microstructures) (claims 18).

A difference between the claims and Kodera is that Kodera does not disclose that the radiation beam amplitude is varied (claim 1).

Other differences between the claims and Kodera are that Kodera does not disclose that the optical microstructures formed are an array of microlenses and that the microstructure master is a microlens array master.

McCullough, in the abstract, in col 2, lines 29-31, in col 6, lines 1-17, discloses that the exposure dose from the illumination source is controlled by varying the amplitude so as to obtain a predetermined amount of exposure dose during the scan exposure process.

Raguin, in the abstract, in col 6, lines 18-24, and lines 64-68, and in col 7, lines 1-7, discloses that the method of forming the claimed microstructures be used to form an array of microlenses.

Therefore, it would be obvious to a skilled artisan to modify Kodera by employing the method of varying the intensity of the exposure light during scan exposure by varying the amplitude of the illumination beam as taught by McCullough because McCullough, in col 6, lines 1-17, discloses that a predetermined amount of

exposure dose can be obtained by varying the amplitude of the illumination beam during the scan exposure. It would be obvious to a skilled artisan to modify Kodera in view of McCullough by employing the suggestion of Raguin by using the method of forming microstructures such as microlens array and using the microstructure master as a microlens master because Kodera teaches forming the microstructures (desired pattern) in optical media substrates, and Raguin, in the abstract, discloses that the optical microstructures formed can be either microlenses or gratings and Raguin, in col 6, lines 63-67, in col 7, lines 1-8, and in col 8, lines 55-57, discloses that the microstructure in the photosensitive material (photoresist) is transferred to the underlying substrate, and the formed microstructure can be replicated (i.e., the microstructure master can be a microlens master) by embossing or molding etc., to form structures that includes microlenses, and that such a pattern formed can also be used to form any optical element for optical interconnects and communications.

3. Claims 11-13, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 4,965,118 (Kodera et al., hereinafter referred to as Kodera) in view U. S. Patent No. 6,292,255 (McCullough) and U. S. Patent No. 6,410,213 (Raguin et al., hereinafter referred to as Raguin) as applied to claims 1, 3-10, 15-18, above, and further in view of U. S. Patent No. 4,087,300 (Adler) and U. S. Patent No. 5,342,737 (Georger, Jr. et al., hereinafter referred to as Georger).

Kodera in view of McCullough and Raguin is discussed in paragraph no. 2.

Differences between the claims and Kodera in view of McCullough and

Raguin include the facts that Kodera in view of McCullough and Raguin does not disclose that the substrate is about a square foot, and that the radiation is impinged for about an hour.

Adler, in col 7, lines 45-54, discloses that the flexible substrate is approximately about 100 feet to about 1000 feet (i.e., an area of at least one square feet) (claims 11, and 28). Adler, in col 8, lines 46-65, discloses that the resin is cured for more than an hour (claims 12-13)

Another difference between the claims and Kodera in view of McCullough and Raguin further in view of Adler is that Kodera in view of McCullough and Raguin further in view of Adler does not disclose that at least about one million microstructures are fabricated.

Georger, in col 11, lines 45-55, discloses that batches per exposure produce at least about 730 million microstructures (microcylinders).

Therefore, it would be obvious to a skilled artisan to modify Kodera in view of McCullough and Raguin by employing the substrate parameters and resin cure time suggested by Adler because Adler, in col 8, lines 46-68, discloses that curing the resin coated plastic substrate of the claimed length on a mandrel for the claimed time ensures a well bonded resin layer with excellent resistance to organic solvents, and blistering, and in col 7, lines 45-57, discloses that the size of the plastic substrate to be rolled on the mandrel is not critical and is based on only the capabilities of the equipment at hand. It would be obvious to a skilled artisan to modify Kodera in view of McCullough and Raguin further in view of Adler by employing the method of making at

least millions of microstructures as suggested by Georger because Georger, in col 7, lines 51-68, discloses that the support structure (substrate) may be of any shape or size and is depended upon the intended use of the array of microstructures to be formed on the support surface, and Georger, in col 11, lines 10-40, discloses that the millions of microstructures formed enables the use of the resultant product to used as electron emitters or as carriers for the controlled release of active agents (microsyringes, microvials etc).

(10) Response to Argument

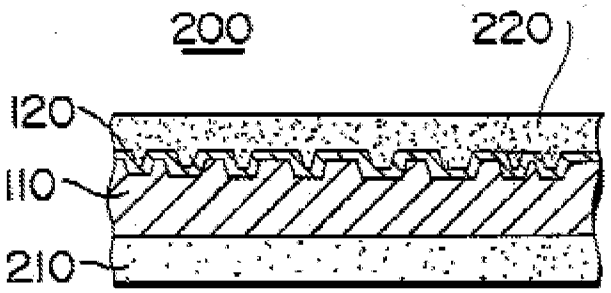
II) a. Independent Claim 1.

A) Appellant argues Kodera does not describe or suggest (1) scanning a radiation beam (2) at varying amplitude (3), through a transparent substrate into a (4) negative photoresist layer on the transparent substrate, (5) to form a latent image of the array of microlenses in the negative photoresist layer as recited in claim 1.

Kodera, in the abstract, in col 6, lines 24-54, in col 7, lines 1-25, in col 8, lines 54-57, in col 20, lines 29-52, and in figures 16 A - 16 B, discloses a substrate (reference 210 of figure 4B, and 16A, and 16B) coated with a UV hardenable resin i.e., UV curable resin (reference 110 of figure 4B, and 16A, and 16B), followed by a transparent resin on the curable resin (reference 220, of figure 4B), exposing the resin (reference 110) through the transparent resin (transparent substrate, reference 220 of figure 4B or figure 16B) or through a UV transmitting layer, reference 210 of figure 16A, using a laser beam that is rastered axially i.e., it is scanned; the laser beam is not exposing only one

spot, it is exposing the entire layer of reference 110 (UV hardenable resin), therefore the laser beam has to be scanned throughout the length of the resin layer in order to expose the entire length of the resin layer to the beam. See figures below,

Fig- 4B



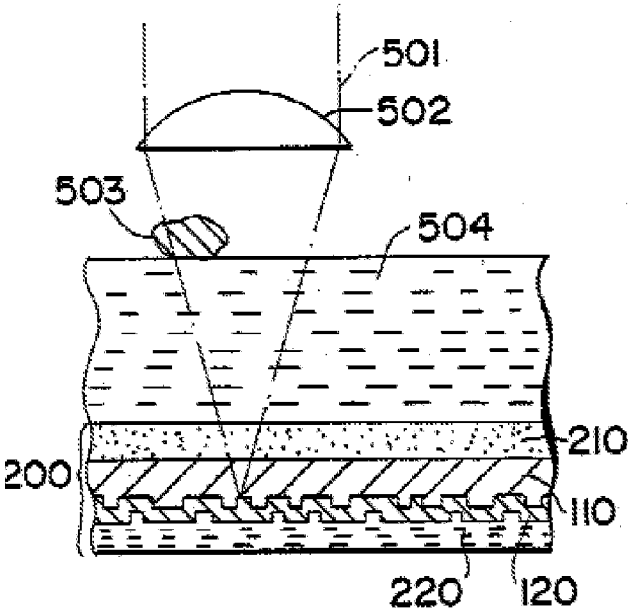


Fig- 16A

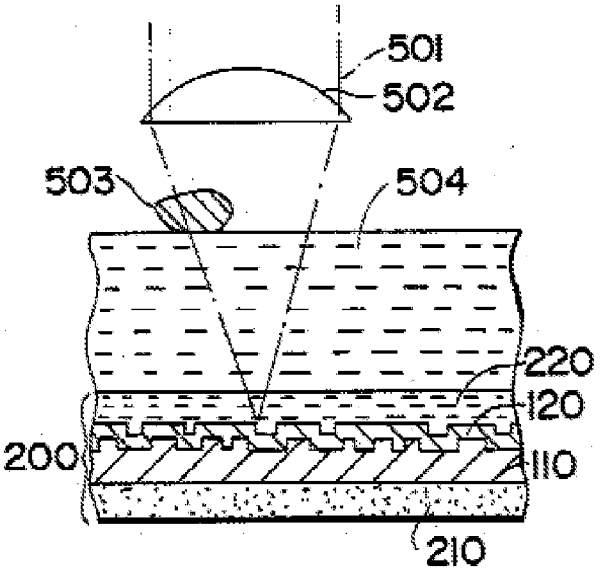


Fig- 16B

Kodera, in col 7, lines 1-25, discloses the use of a UV hardenable resin to form the pattern, wherein the UV hardenable resin cures or hardens upon exposure to UV or e-

beam etc., and does not deteriorate upon exposure; and that the resin can be a polyester methacrylate etc., and can include a sensitizer etc., i.e., the resin is not a positive resist it is a negative resist (since it cures or hardens upon exposure). Kodera, in col 6, lines 8-20, and lines 42-54, discloses forming a flexible optical disk wherein a pattern is formed in the UV hardenable resin via exposure. Although, Kodera, in col 11, lines 19-21, discloses that the exposure dose is suitable determined based on the resin material used, i.e., the exposure dose is not a fixed value, it can be changed or modified; however, Kodera is not relied upon to disclose varying the amplitude of the radiation. McCullough is depended upon to disclose varying the amplitude of the illumination source of the exposure beam. McCullough, in col 2, lines 19-24, and in col 6, lines 7-18, discloses that the illumination control modifies the exposure dose of the radiation as a function of distance in the scan direction wherein the exposure dose is modified by varying the amplitude of the radiation, see below,

tion. A scanning photolithographic system having an illumination source projecting the image of a reticle onto a photosensitive substrate with projection optics has an illumination control that modifies the exposure dose of electromagnetic radiation by a predetermined amount as a function of distance in the scan direction. This compensates for

the scan direction. The dose control **70** may modify the illumination source directly by varying the amplitude or intensity, or in a pulsed illumination source by varying the number or rate of pulses so as to obtain the required predetermined exposure dose. The illumination source may be a laser or any other known illumination source. The dose control **70** may also control any other structure, technique, or method for varying the illumination or dose received by the photosensitive substrate **64**, such as by the use of filters, apertures, shutters, the introduction of additional lens elements, or any other equivalent or known way to modify exposure dose.

Although, Kodera forms a pattern in the resin, i.e., form an optical disk with an uneven pattern (optical microstructures), Kodera does not disclose that the pattern formed via radiation is a microlens pattern. Kodera is not relied upon to disclose forming an array of microlens. Raguin is relied upon to disclose forming optical microstructures such as microlenses. Raguin, in col 6, lines 18-24, and lines 63-65, in col 7, lines 5-7, in col 11, lines 14-67, discloses forming optical microstructures such as microlenses (array of microlenses) on a photosensitive material via exposure. Therefore, Kodera in view of McCullough and Raguin teaches claim 1 limitations.

B) Appellant argues that Kodera does not need to scan a radiation beam at varying amplitude and that Kodera's flooding of radiation simply hardens the resin.

As discussed above in argument A), Kodera, in figures 16A, and 16B), illustrates scanning the laser beam across the length of the resin layer. The resin layer hardens only upon exposure to radiation. The resin layer (reference 110) does not form the image of pattern by mere deposition, the resin layer is exposed to irradiation in order to harden i.e., cure so as to form the desired pattern of information recording medium. The appellant's claimed negative photoresist layer is exposed to radiation and thus is

cured. A negative resist cures upon irradiation. Kodera is not depended upon to disclose varying the amplitude of the radiation beam. However, Kodera does not require that the dosage of the radiation (UV or laser or e-beam) be a constant value because, Kodera, in col 11, lines 19-21, discloses that the dosage of the UV rays may be suitably determined based on the resin material i.e., the dosage of the beam can be varied. McCullough, in the abstract, and in col 6, lines 7-18, discloses that the amplitude of the exposure beam can be varied in order to modify the exposure dosage.

C) Appellant argues that Kodera does not disclose (1) scanning a radiation beam, (2) at varying amplitude and that Kodera does not form (5) an array of microlenses.

These limitations have been addressed in argument A), and B) above.

D) Appellant argues that Kodera's "resin liquid" does not appear to be capable of producing an image-wise pattern and is not subjected to a development process.

Appellant's claim 1 does not require a development process. See below,

1. (Previously Presented) A method of fabricating an array of microlenses comprising:

scanning a radiation beam at varying amplitude through a substrate that is transparent thereto into a negative photoresist layer on the substrate to image the array of microlenses in the negative photoresist layer.

However, Kodera, in col 6, lines 66-68, in col 7, lines 1-3, discloses exposing and developing the photoresist to form the uneven pattern corresponding to the information to be recorded, see below,

described below. First, a photoresist is painted onto a glass plate and exposed by using a mask having a pattern corresponding to information to be recorded, to thus

make an original block on which an uneven pattern corresponding to information to be recorded is formed after going through a development process. Resin, e.g.,

E) Appellant argues Kodera does not describe the recitation of (1), (2), (4), and (5) of claim 1.

This has been addressed in argument A) above.

F) Appellant argues that McCullough teaches away from varying the amplitude of a radiation beam to image the array of microlenses as recited in claim 1.

McCullough, in col 5, lines 29-67, and in col 6, lines 1-18, discloses forming images in a photosensitive substrate via scanning exposure, and that the exposure dosage is based on the dose control (computing device with a control system that calculates a corrected exposure dose) wherein the dose control is a function of distance along the scan direction; the dose control that controls the exposure dosage can only be modified by varying the amplitude of the illumination beam (illumination source) or by varying the intensity. Therefore, McCullough does not teach away from varying the amplitude of the radiation beam to image the photosensitive substrate (photoresist coated substrate) to form the pattern. Raguin is relied upon to disclose imaging microlenses, see argument A) above. See below,

the scan direction. The dose control 70 may modify the illumination source directly by varying the amplitude or intensity, or in a pulsed illumination source by varying the number or rate of pulses so as to obtain the required predetermined exposure dose. The illumination source may

And col 6, lines 36-46, see below,

function **32**, illustrated in FIG. **3**. A corrected exposure dose is calculated by increasing or decreasing the exposure dose by an amount determined by the resist response function to correct for variations in linewidth as determined by the signature. Accordingly, linewidth variations are substantially reduced in the direction of scan. Block **370** represents the act or step of varying an exposure dose as a function of position in the direction of scan based on the corrected exposure dose. Varying an exposure dose may be easily performed with any dose control means, such as dose control **70** illustrated in FIG. **7**.

G) Appellant argues that Raguin describes formation of microlenses but does not supply any of the other missing teachings.

Raguin is relied upon to disclose the formation of microlenses. The other limitations of claim 1 have been addressed in arguments A), and B) above.

H) Appellant argues that Raguin does not appear to provide any exposure through the substrate by scanning a radiation beam at varying amplitudes through a substrate into a negative photoresist layer.

Raguin teaches exposing via a scanning exposure process the photoresist coated substrate to form optical microstructures such as microlenses. See column 7, lines 9-11, see below,

in-accordance with this invention. One exposes photoresist using a single or multiple focused laser beam that rasters across a photosensitive substrate. There are two scanning

Raguin is not relied upon to disclose performing an exposure at varying amplitudes through a substrate into a negative photoresist layer. These limitations have been addressed in arguments A) and B) above.

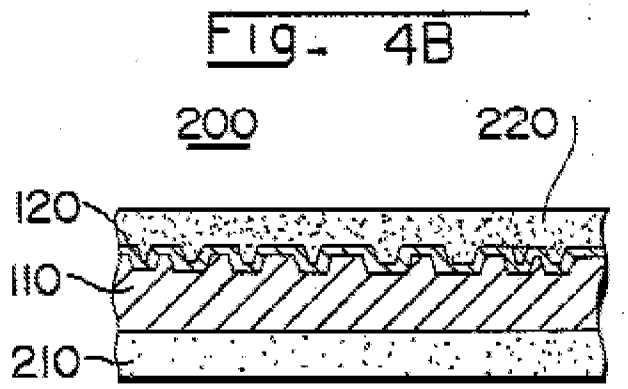
I) Appellant argues Greton et al., (US 2002/0034014) provides secondary considerations of nonobviousness, and that appellant's negative resist can be used to form microlenses and provide many advantages.

The reference Greton et al., is not pertinent to the present claimed invention and is not persuasive to rebut the rejections. Greton et al., teaches using a positive photoresist to form a microlens. Greton et al., clearly cites the advantages of positive resist over negative resist, and therefore cannot be applied over the present claims that require a negative resist. Kodera in view of McCullough and Raguin, as discussed in arguments A), and B), above disclose using a negative resist (UV hardenable resin) to form microstructures such as microlenses via scanning exposure at varying amplitude through a transparent support layer on which the hardenable resin is formed.

II b. Dependent Claim 3.

A) Appellant is arguing pages 18-19, and figures 16, and 13A, and 13B of the instant specification and the unrelied art US Patent application Publication 2002/0034014 (Greton et al) as reasons for claim 3 to be independently patentable.

Kodera in view of McCullough and Raguin is relied upon to disclose claim 3. Kodera, in figures 16A, and 16B, disclose a UV hardenable (negative tone resist) resin layer that is thicker than the pattern to be formed in the optical disk (see reference 110 of figures 16A and 16B); see figure 4B, below,



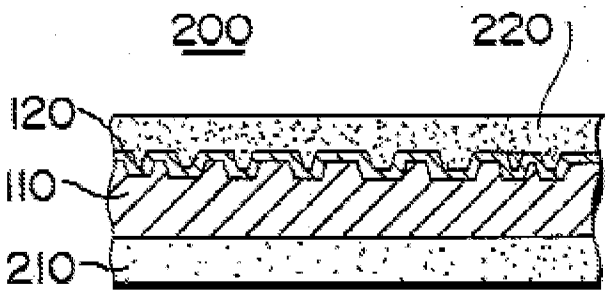
Also, as discussed above in **II a.** arguments A), B), and I) above, Kodera, in view of McCullough and Raguin discloses scanning a radiation beam at varying amplitude through a transparent substrate (reference 210 of figure 16A, and reference 220 of figure 16B, are all transparent to the beam irradiated) into the negative photoresist (UV hardenable resin) to image microlenses. As discussed in **II a.** argument I) above, US 2002/0034014 (Greton et al) is not pertinent to the claimed invention. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims.

II c. Dependent Claim 4.

A) Appellant argues that the quoted portions from pages 18-19, of the specification provide further proof of the independent patentability of claim 4.

Kodera, discloses forming a pattern of information recording medium in the resin layer, see reference 110, in figure 4B, and in figures 16A, and 16B, and the pattern imaged via UV hardening is narrower than base of the resin layer (reference 110) see figure 4B, 16A, and 16B, below,

Fig. 4B



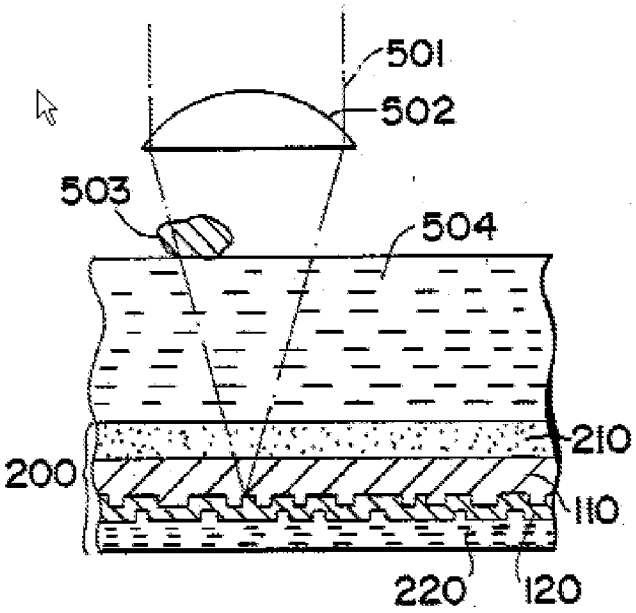


Fig. 16A

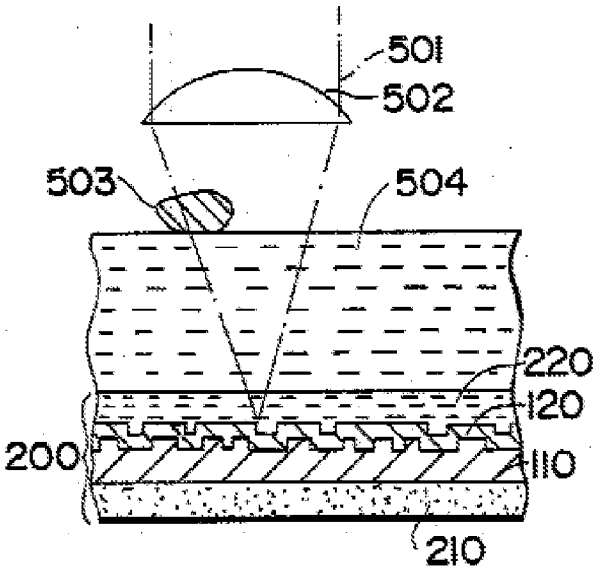


Fig. 16B

Also, see **II a.** Argument A), B), and **II b.** Argument A).

II d. Dependent Claim 5.

A) Appellant argues that the cited art does not describe or suggest any of the recitations of claim 5.

As discussed in **II a.** Arguments A), B), and I) above, Kodera in view McCullough and Raguin discloses using a negative resist (UV hardenable resin) to form

microstructures such as microlenses via scanning exposure at varying amplitude through a transparent support layer (see reference 210 of figure 16A) on which the hardenable resin is formed. Kodera, in col 7, lines 1-67, and in figure 4B, discloses that the UV hardenable resin is coated onto an uneven surface and thus the resin layer is not uniform i.e., variable thickness exists in the resin layer to be exposed. And, as illustrated in figure 4B, in **II c.** above, the negative resist i.e., UV hardenable resin is thicker than the pattern formed, and as illustrated in figure 16A, the pattern is formed beneath the resin layer (see reference 110 of figure 16A) wherein the exposure beam is not depended upon to the variable thickness of the resin layer, see below,

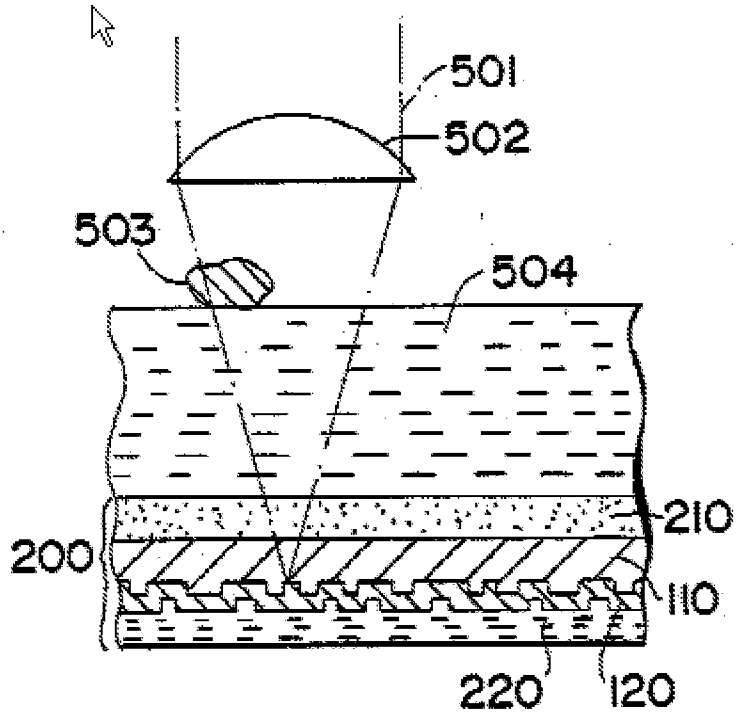


Fig- 16A

II e. Dependent Claim 6.

A) Appellant argues that the cited art does not disclose the claimed recitations, and that the cited portions of the specification provide evidence of independent patentability.

Kodera in view McCullough and Raguin discloses using a negative resist (UV hardenable resin) to form microstructures such as microlenses via scanning exposure at varying amplitude through a transparent support layer (see references 210, and 220 of figures 16A, and 16B respectively) on which the hardenable resin is formed, wherein the hardenable resin is adjacent to the substrate. Kodera, in figures 14A, 14B, and in figures 16A, and 16B, discloses impurities present on the negative resist i.e., UV hardenable resin, see below,

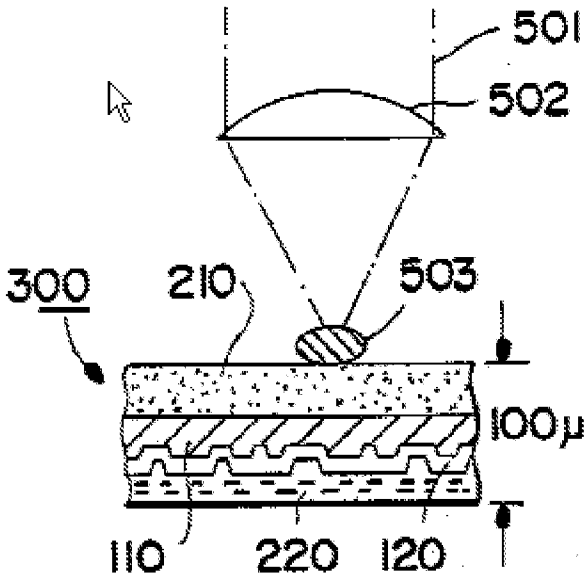


Fig-14A

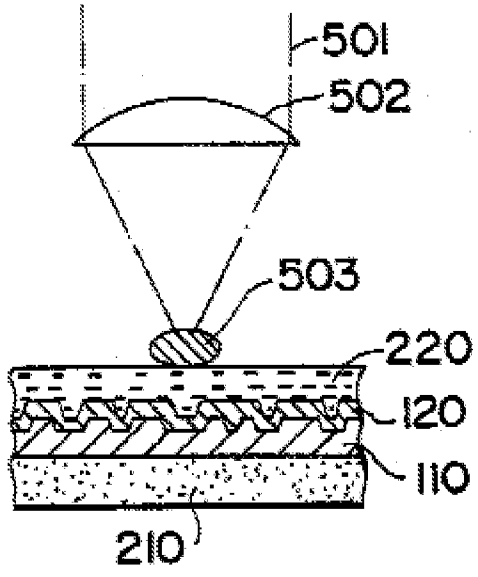


Fig-14B

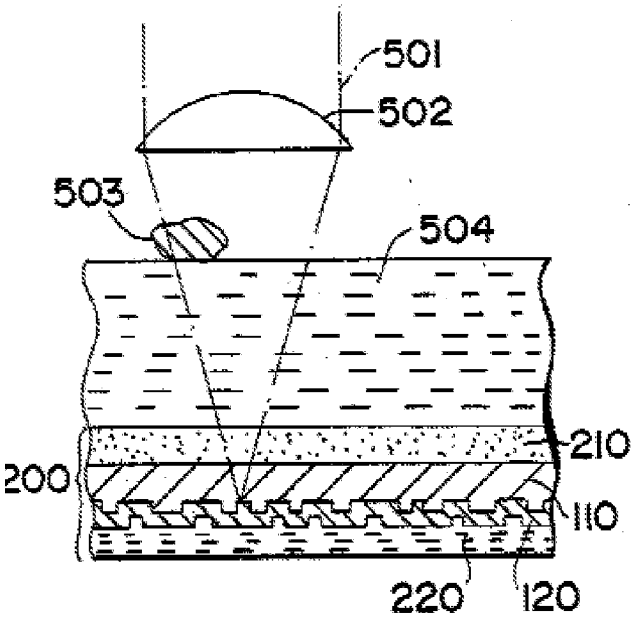


Fig- 16A

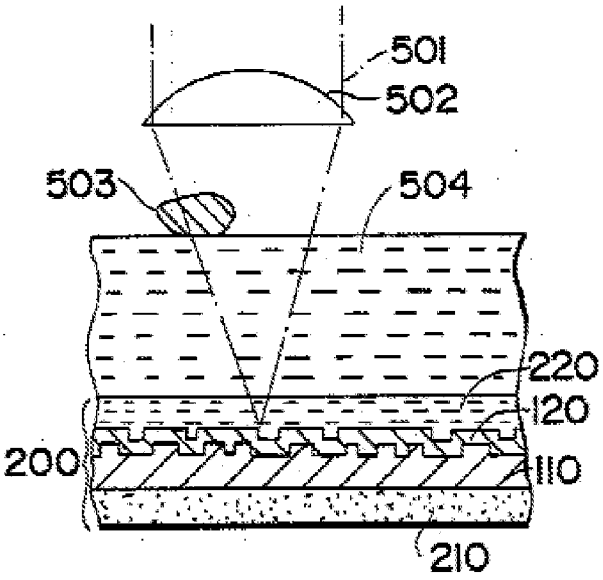
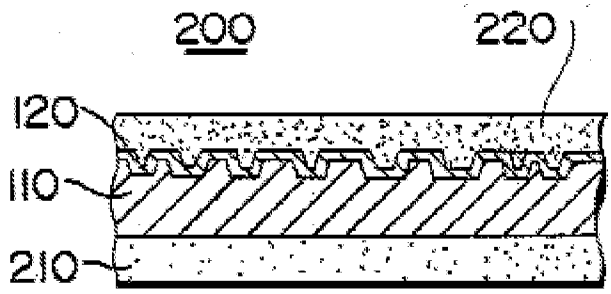


Fig- 16B

Kodera, in col 20, lines 23-26, discloses that dust or rubbish i.e., impurities exist on the optical disk (reference 200) to be imaged, see optical disk 200 below,

Fig- 4B



and Kodera, in col 20, lines 37-43, discloses that even if such material (dust or particle or adhesive material, reference 503) exists it will not affect the laser beam from reading the information to be recorded i.e., it will not affect the exposure of the laser beam.

Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims.

II f. Dependent Claim 8.

A) Appellant argues that McCullough teaches away from varying amplitude of the scanned radiation in order to image an array of microlenses.

This argument has been addressed in **II a.** Argument F) above.

II g. Dependent Claims 7, 9, 10, and 15-18.

A) Appellant argues that dependent claims 7, 15-18, are patentable as per the patentability of independent Claim 1 from which they depend.

See arguments A) through I) of **II a.** above.

B) Appellant argues that dependent Claims 9, and 10, are patentable as per the patentability of depended Claim 8 from which they depend.

See argument A) of **II f.** , and Argument F) of **II a.** above.

III Claims 11-13.

A) Appellant argues that dependent claims 11-13, are patentable as per the patentability of independent Claim 1 from which they depend.

See arguments A) through I) of **II a.** above.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Daborah Chacko-Davis/

Conferees:

/Romulo Delmendo/ (Conferred 11/29/2007)
Romulo Delmendo

/Mark F. Huff/
Supervisory Patent Examiner, Art Unit 1795